# High School – Algebra 1

Kentucky Core Academic Standards with Targets





Grade Level/	Course: Algebra 1 Unit 1
Standard:	N.Q.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
Domain:	Quantities* (*Modeling Domain)
Cluster:	Reason quantitatively and use units to solve problems.
Туре:	KnowledgeXReasoningPerformance SkillProduct

Knowledge Targe	ets	Reasoning Targets Performance Skills Targets Product Targets						
Calculate unit co	nversions.	~		a problem as a wa ulti-step problem i	•			
Recognize units g solve problem.	given or needed to	reasonable (e.g.	length problems d	lictate different un sure such as slope)				
		Choose appropriate units to represent a problem when using formulas or graphing.						
		Interpret units or scales used in formulas or represented in graphs.						
		Use units as a way to understand problems and to guide the solution of multi-step problems.						
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Atter preci		Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/	Grade Level/ Course: Algebra 1 Unit 1							
Standard with code:	I.Q.2 Define appropriate quantities for the purpose of descriptive modeling.							
Domain:	Quantities* (*Modeling Domain)							
Cluster:	Reason quantitatively and use units to solve problems.							
Туре:	KnowledgeXReasoningPerformance SkillProduct							

Knowledge Tar	gets	Reasoning Targ	Reasoning Targets			Performand Targets	ce Skills	Product Targets
Define descript	ive modeling.	Determine app of descriptive n	ropriate quantition nodeling.	es for the purpos	e			
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.		end to cision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/	Grade Level/ Course: Algebra 1 Unit 1						
Standard:	N.Q.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.						
Domain:	Quantities* (*Modeling Domain)						
Cluster:	Reason quantitatively and use units to solve problems.						
Туре:	Knowledge X Reasoning Performance Skill Product						

Knowledge Targ	gets	Reasoning Targe	ets		Performance	e Skills Targets	Product Targets
Identify appropriate units of measurement to report quantities.  Determine the limitations of different measurement tools.  Choose and justify a level of accuracy and/or precision appropriate to limitations on measurement when reporting quantities.  Identify appropriate units of appropriate to limitations on measurement when reporting quantities.  Identify important quantities in a problem or real-world context.					Terrormane	z skiiis Turgets	Troduct rangets
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	 nd to ision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ Co	Grade Level/ Course (HS): Algebra 1 Unit 1							
Standard with	.SSE.1a Interpret expressions that represent a quantity in terms of its context.*(*Modeling standard)							
code:	Interpret parts of an expression, such as terms, factors, and coefficients.							
Domain:	Seeing Structure in Expressions							
Cluster:	Interpret the structure of expressions							
Туре:	Knowledge XReasoningPerformance SkillProduct							

Knowledge Targ	ets	Reasoning Targe	Reasoning Targets				e Skills Targets	Product Targets
such as terms, fa coefficients.  Notes from Appelinear expression exponential exp integer exponen	tity, define and of an expression, actors, and endix A: limit to as and to ressions with its.	For expressions that represent a contextual quantity, interpret parts of an expression, such as terms, factors, and coefficients in terms of the context.  Notes from Appendix A: limit to linear expressions and to exponential expressions with integer exponents.						
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.		end to cision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ Co Standard with code:	SSE.1b Interpret expressions that represent a quantity in terms of its context.* (Modeling standard) Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $1+r$ ) $^n$ as the product of P and a factor not depending on P.					
Domain:	Seeing Structure in Expressions					
Cluster:	Interpret the structure of expressions					
Type:I	Knowledge X_ReasoningPerformance SkillProduct					

Knowledge Targ	ets	Reasoning Targe	ets		Perfo	rmance Skills Targets	Product Targets	
The underpinni this standard <b>A.SSE.1a:</b> For ex represent a cont define and recog	ing knowledge for lis addressed in kpressions that textual quantity, gnize parts of an as terms, factors, endix A: Limit to	For expressions that represent a contextual quantity, interpret complicated expressions, in terms of the context, by viewing one or more of their parts as a single entity.  Notes from Appendix A: Limit to linear expressions with integer exponents						
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.	

Grade Level/	Course: Algebra 1 Unit 1						
Standard with code:	CED.1 Create equations and inequalities in one variable and use them to solve problems. <i>Include equations</i> rising from linear and quadratic functions, and simple rational and exponential functions.						
Domain:	Creating Equations* (*Modeling Domain)						
Cluster:	Create equations that describe numbers or relationships						
Туре:	KnowledgeX_ReasoningPerformance SkillProduct						

Knowledge Targets					ng Targets	Performa Skills Targ		Product Targets	
Solve linear and exponential equations in one variable.  Solve inequalities in one variable.					quations (linear a ualities in one va solve problems.				
Describe the relationships between the quantities in the problem (for example, how the quantities are changing or growing with respect to each other); express these relationships using mathematical operations to create an appropriate equation or inequality to solve.				variable Compare	quations and inector model real-work and contrast proyulation of the contrast proyulation of the contrast proyulation of the contract of the c				
Note from Appendix A: Limit to linear and exponential equations, and, in the case of exponential equations, limit to situations requiring evaluation of exponential functions at integer inputs.				exponen requiring	m Appendix A: In tial equations, lir g evaluation of ex s at integer input	nit to situations ponential			
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model wathen		Use appropriate tools strategically.	Attend to precision.	Look for and mak use of structure.	exp in r	ok for and press regularity repeated soning.

Grade Level/ Co	Grade Level/ Course: Algebra 1 Unit 1					
Standard:	A.CED.2 Create equations in two or more variables to represent relationships between quantities, graph equations on a coordinate axes with labels and scales.					
Domain:	Create Equations* (*Modeling Domain)					
Cluster:	Create equations that describe numbers or relationships					
Type:KnowledgeX_ReasoningPerformance SkillProduct						

Knowledge Targe	ets	Reasoning Targe	ets			Performance	e Skills Targets	<b>Product Targets</b>
Identify the quant mathematical proworld situation the represented by dand describe what variables represed Graph one or more equation on a country with appropriate Notes from Appetargets are limited exponential equations of exponent limited to situation of exponential exponential exponential equations are situation of exponential exponenti	tities in a oblem or real- nat should be istinct variables at quantities the nt.  re created ordinate axes labels and scales.  Indix A: The d to linear and ottions, and, in the ial equations, ons requiring conential	Create at least variables to rep quantities  Justify which quareal-world situat one another and relationships.  Determine apprograph depicting to created in two or Notes from Appearand exponential equations and exponential equations and exponential equations.	two equations in present relationshantities in a mather ion are dependent which operations opriate units for the relationship bear more variables. Endix A: The target equations, and, in ations, limited to s	matical problem of and independent represent those e labels and scale of tween equations	r of of a	renormanic	e skiiis rargets	Frouuct rargets
functions at integ	Reason abstractly	Construct viable	Model with	Use appropriate	Atten	nd to	Look for and make	Look for and
problems and persevere in solving them.	and quantitatively.	arguments and critique the reasoning of others.	mathematics.	tools strategically.	precis		use of structure.	express regularity in repeated reasoning.

Grade Level/ Course (HS): Algebra 1 Unit 1						
Standard with code:	A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.  For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.					
Domain:	Creating Equations*					
Cluster:	Create equations that describe numbers or relationships					
Type:KnowledgeX_ReasoningPerformance SkillProduct						

Knowledge Targ	gets	Reasoning Targe	ets			Performance	e Skills Targets	<b>Product Targets</b>
Recognize whe	_	Interpret soluti a modeling con		nonviable options	s in			
From Appendix A: Limit targets to linear equations and inequalities.		Determine when a problem should be represented by equations, inequalities, systems of equations and/ or inequalities.  Represent constraints by equations or inequalities, and by systems of equations and/or inequalities.  From Appendix A: Limit targets to linear equations						
		and inequalities.						
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.		end to cision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ Course: Algebra 1 Unit 1					
Standard:	A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.  For example, rearrange Ohm's law V = IR to highlight resistance R.				
Domain:	Creating Equations* (*Modeling Domain)				
Cluster:	Create equations that describe numbers and relationships				
Type:KnowledgeX_ ReasoningPerformance SkillProduct					

Knowledge Targe	ets	Reasoning Targe	ets			Performance	e Skills Targets	<b>Product Targets</b>
Define a "quant	ity of interest"	Rearrange form	nulas to highlight	a quantity of				
to mean any nu	merical or	interest, using	the same reasoni	ng as in solving				
algebraic quant		equations. (e.g.	$\pi * r^2$ can be re-w	ritten as (π *r)*r				
$2\left(\frac{a}{b}\right) = d$ , in whi	ich 2 is the	which makes the	e form of this expre	ession resemble b*	h.)			
	est showing that d							
must be even; $\frac{\pi r}{3}$	$\frac{r_h}{r_c} = V_{cone}$ and		A: Unit 1 is limit					
$\pi r^2 h = V_{cylinder}$	showing that	which are linea	r in the variable	of interest.				
$V_{cylinder} = 3 * V_{cylinder}$	cons)							
From Appendix to formulas whi the variable of i								
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Atter preci		Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ Co	Grade Level/ Course: Algebra 1 Unit 1					
Standard with code:	A.REI.1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.					
Domain:	Reasoning with equations and inequalities					
Cluster:	Understand solving equations as a process of reasoning and explain the reasoning.					
Type:KnowledgeX_ReasoningPerformance SkillProduct						

Knowledge Targets	S	Reasoning Targe	ets			Performance	e Skills Targets	<b>Product Targets</b>
Know that solving a	an equation	Determine if an e	equation has a solu	ution.				
means that the equipal balanced during ear		Choose an appro	Choose an appropriate method for solving the equation.					
Recall the propertie	es of equality.	Justify solution(s) to equations by explaining each step in solving a simple equation using the properties of						
Explain why, when	solving	equality, beginni	ng with the assum	ption that the orig	inal			
equations, it is assu	umed that the	equation is equa	l.					
original equation is	equal.	Construct a mathematically viable argument justifying a						
From Appendix A:	Students	given, or self-generated, solution method.						
should focus on and	d master							
A.REI.1 for linear ed	•							
able to extend and								
reasoning to other								
equations in future courses.								
Make sense of R	Reason abstractly	Construct viable	Model with	Use appropriate	Atte	nd to	Look for and make	Look for and
	and quantitatively.	arguments and	mathematics.	tools strategically.	prec	ision.	use of structure.	express regularity
persevere in solving them.		critique the reasoning of						in repeated reasoning.
Solving them.		others.						reasoning.

Grade Level/	Course: Algebra 1	Unit 1						
Standard:	A.REI.3 Solve lin by letters.	A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.						
Domain:	Reasoning with	Equations and In	equalities					
Cluster:	Solve equations	and inequalities	in one variable					
Туре:	_Knowledge _	XReasonin	gPeri	formance Skill		Product		
Knowledge Tar	gets	Reasoning Targe	ets			Performanc	e Skills Targets	<b>Product Targets</b>
Recall properties of equality  Solve multi-step equations in one variable  Solve multi-step inequalities in one variable		the inequality sy set.	ymbol and use this and inequalities v	I coefficients have on the solution of the sol				
Make sense of problems and persevere in	Reason abstractly and quantitatively.	Construct viable arguments and critique the	Model with mathematics.	Use appropriate tools		end to cision.	Look for and make use of structure.	Look for and express regularity in repeated

solving them.

reasoning of

others.

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strategically.

reasoning.

Grade Level/ Course (HS): Algebra 1 Unit 2					
Standard with code:	N.RN.1 Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. For example, we define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.				
Domain:	The Real Number System				
Cluster:	Extend the properties of exponents to rational exponents				
Туре:	KnowledgeX ReasoningPerformance SkillProduct				

Knowledge Ta	irgets	Reasoning Targ	ets		Performance Targets	Skills	Product Targets
Define radical notation as a convention used to represent rational exponents.		Explain the properties of operations of rational exponents as an extension of the properties of integer exponents.					
		Explain how radical notation, rational exponents, and properties of integer exponents relate to one another.					
		standards in cur	endix A: In impleme riculum, these star scussing exponenti nains.	ndards should			
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ Course (HS): Algebra 1 Unit 2						
Standard with code:	I.RN.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents.					
Domain:	The Real Number System					
Cluster:	Extend the properties of exponents to rational exponents					
Type: X Knowledge Reasoning Performance Skill Product						

Knowledge Targets		Reasoning Ta	irgets		Perfo Targe	ormance Skills ets	Product Targets
rewrite a radical	rties of exponents, expression as an a rational exponen	t.					
rewrite an expre	rties of exponents, ession with a rational dical expression.	al					
occur before dis	•	I					
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and ma use of structure.	

Grade Level/ Co	Grade Level/ Course (HS): Algebra 1 Unit 2							
Standard with code:	A.REI.5 Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.							
Domain:	Reasoning with Equations and Inequalities							
Cluster:	Solve system of equations							
Type:I	Type:KnowledgeXReasoningPerformance SkillProduct							

Knowledge Targ	ets	Reasoning Targe	ets	Performance	Skills Targets	<b>Product Targets</b>	_
Recognize and usequality to main systems of equal	se properties of tain equivalent	Justify that repla in a two-equatio	icing one equation in system with the ation and a multiple yield the same				
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ Co	ourse: Algebra 1 Ur	nit 2								
Standard with code:	•	A.REI.6 Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.								
Domain:	Reasoning with	Reasoning with Equations and Inequalities								
Cluster:	Solve systems o	f equations								
Type:I	 Knowledge     X	Reasoning	Performance	SkillPr	oduc	:t				
Knowledge Targets Reasoning Targets					Performance Skills Product To					
Solve systems o by any method.	f linear equations	equations exactlof linear equation  Notes from Apper graphing and solution middle school to used. Include cathe same line (yi cases where two (yielding no solution)	endix A: Build on st ving systems of lin focus on justificat ses where the two elding infinitely ma equations describ tion); connect to G ich requires stude	ely focusing on pair cudent experiences ear equations from ion of the methods equations describ any solutions) and	ght					
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.		end to cision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.		

Grade Level/ Co	Grade Level/ Course (HS): Algebra 1 Unit 2								
Standard with code:		A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the oordinate plane, often forming a curve (which could be a line).							
Domain:	Reasoning with E	Equations and Inc	equalities						
Cluster:	Represent and so	olve equations ar	nd inequalities g	raphically					
Type: <u>X</u>	Knowledge	Reasoning	Performar	nce Skill	_Product				
Knowledge Targ		Reasoning Targe	ets		Performan	ce Skills Targets	Product Targets		
is a solution to it  Notes from Appe A.REI.10, focus o exponential equato adapt and app	of an equation in a curve, which t line. In point on a curve as equation.								
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.		

Grade Level/ Standard:	solutions of the equation $f(x) = g(x)$ ; find the solutions approximately, e.g., using technology to graph the functions, make							
	tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.* (Modeling standard)							
Domain:	Reasoning with Equations and Inequalities							
Cluster:	Represent and solve equations and inequalities graphically							
Туре:	KnowledgeXReasoningPerformance SkillProduct							

Knowledge Targe	ets	Reasoning Targe	ets			Performance	e Skills Targets	<b>Product Targets</b>
Recognize and us	e function	Explain why the	x-coordinates of th	e points where the	(1)			
notation to repre	sent linear and	graph of the equ	ations y=f(x) and y	=g(x) intersect are	the			
exponential equa	tions	solutions of the	equations $f(x) = g(x)$	a) . (Include cases				
Recognize that if share the same lo	$(x_1, y_1)$ and $(x_2, y_2)$ ocation in the	where f(x) and/o equations)	where f(x) and/or g(x) are linear and exponential equations)					
coordinate plane	that $x_1 = x_2$ and	Approximate/fin	d the solution(s) u	sing an appropriate	9			
$y_1 = y_2$ .			nple, using technol					
Recognize that f(x) that there may be of f and g for whith f and g are equal.	e particular inputs ch the outputs of	approximations (	tables of values or (Include cases whe ential equations).	find successive re f(x) and/or g(x) a	are			
Notes from Appe	ndix A: For							
1	n cases where f(x)							
and g(x) are linea	r or exponential.							
Make sense of	Reason abstractly	Construct viable	Model with	Use appropriate	Atte	nd to	Look for and make	Look for and
problems and persevere in solving them.	and quantitatively.	arguments and critique the reasoning of others.	mathematics.	tools strategically.	prec	ision.	use of structure.	express regularity in repeated reasoning.

Standard with code:	A.REI.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.									
Domain:	Reasoning with Equations and Inequalities									
Cluster:	Represent and Sol	Represent and Solve Equations and Inequalities Graphically								
Туре:	Knowledge	Reasoning	Performance Sk	cillXPr	oduct					
Knowledge Tar	gets	Reasoning Targ	ets		Performance Sk Targets	ills	Prod	uct Targets		
inequality and sinequalities, su boundary line (shading, and de	ntify characteristics of a linear quality and system of linear qualities, such as: undary line (where appropriate), ding, and determining appropriate t points to perform tests to find a		aning of the inters in a system of line				boun shade appro for a linear and s appro overl for a	h a line, or dary line, and e the opriate region two variable r inequality.  h a system of r inequalities hade the opriate apping region system of linear ialities.		
Make sense of problems and persevere in solvin them.	Reason abstractly an quantitatively.	construct viable arguments and critique the reasoning of other	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.		Look for and express regularity in repeated reasoning.		

Grade Level/	Grade Level/ Course: Algebra I Unit 2							
Standard with code:	F.IF.1 Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If $f$ is a function and $x$ is an element of its domain, then $f(x)$ denotes the output of $f$ corresponding to the input $x$ . The graph of $f$ is the graph of the equation $y = f(x)$ .							
Domain:	Interpreting Functions							
Cluster:	Cluster: Understand the concept of a function and use function notation.							
Type:X	KnowledgeReasoningPerformance SkillProduct							

Knowledge Targ	ets		Reasoning Ta	rgets	P	erformance	Skills Targets	Product Targets
Identify the dom	ain and range of a	function.						
Determine if a re	elation is a function							
notation (i.e. f(x)	alue of the functior =y, the y value is th ticular value of x)							
Evaluate function	ns for given values	of x.						
Note from Appendix A: Students should experience a variety of types of situations modeled by functions. Detailed analysis of any particular class of functions at this stage is not advised. Students should apply these concepts throughout their future mathematics courses.								
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend precisio		Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/	Course: Algebra I Unit 2
Standard with code:	F.IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
Domain:	Interpreting Functions
Cluster:	Understand the concept of a function and use function notation.
Туре:	KnowledgeXReasoningPerformance SkillProduct

Knowledge Targ	ets	Reasoning Targe	ets			Performance	Skills Targets	<b>Product Targets</b>
Identify mathematical Interpret statements that use functions in terms of real					al			
relationships and	l express them	world situations,	, focusing on linear	and exponential				
using function no	otation.	functions.	unctions.					
Define a reasonable domain, which depends on the context and/or mathematical situation, for a function focusing on linear and exponential functions.  Note from Appendix A: Students should experience a variety of types of situations modeled by functions.  Detailed analysis of any particular class of functions at this stage is not advised. Students should apply these concepts throughout their future mathematics courses.				t				
Evaluate function in the domain, for and exponential	_							
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Atten		Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/	Course: Algebra I Unit 2								
Standard	F.IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the								
with code:	integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$ , $f(n + 1) = f(n) + f(n - 1)$ for $n \ge 1$ .								
Domain:	Interpreting Functions								
Cluster:	Understand the concept of a function and use function notation.								
Туре:	KnowledgeXReasoningPerformance SkillProduct								

Knowledge Targ	ets			Reas	oning Targets		Performance	e Skills Targets	Product Targets
Recognize that									
defined recursi	vely, whose doma	ain is a subset of t	he						
integers. For ex	xample, the Fibon	acci sequence is a	defined						
recursively by f	(0) = f(1) = 1, f(n +	f(n) = f(n) + f(n - 1)	) for n ≥ 1.						
Notes from App	oendix A: Student	s should experien	ice a						
variety of types	of situations mo	deled by function	ıs.						
Detailed analys	is of any particula	ar class of function	ns at this						
stage is not adv	rised. Students sh	ould apply these	concepts						
throughout the	ir future mathem	atics courses. Dra	aw						
examples from	linear and expon	ential functions. I	n F.IF.3,						
draw connection	on to F.BF.2, which	h requires studen	ts to write						
arithmetic and	geometric sequei	nces. Emphasize a	arithmetic						
and geometric	sequences as exa	mples of linear ar	nd						
exponential functions.									
Make sense of	Reason abstractly	Construct viable	Model with		Use appropriate	Atte	nd to	Look for and make	Look for and
problems and	and quantitatively.	arguments and	mathematics.		tools strategically.	prec	ision.	use of structure.	express regularity
persevere in solving them.		critique the reasoning of							in repeated reasoning.
0		others.							

Grade Level/Cou	rse (high School):	Algebra I Unit 2								
Standard with	F.IF.4 For a fur	F.IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in								
Code:		erms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key								
	•	•	rvals where the fui	_	· · · · · · · · · · · · · · · · · · ·		relative			
			netries; end behav	ior; and periodicity	y. *(*Modeling sta	ndard)				
Domain:	Interpreting F	unctions								
Cluster:	Interpret funct	tions that arise in a	applications in terr	ns of the context.						
Type:Kno	wledge <u>X</u> R	easoning	Performance Skill	Product						
Knowledge Targe	ets	Reasoning Targe	ts	Performance Skil	II Targets	<b>Product Targets</b>				
Define and recog		Interpret key fea								
features in table:	• .	and tables of fun								
linear and expon			textual quantities							
intercepts; interv		the function repr	esents.							
function is increa	O. O.	Chatch granhs sh	oving kov							
positive, or nega	tive, and end	Sketch graphs she	ction that models							
behavior.		a relationship be								
Identify whether	the function is	quantities from a								
linear or expone		description of the	•							
table or graph.	itiai, giveirits	description of the	c relationship.							
table of graph.		Notes from Appe	endix A: Focus on							
Notes from Appe	ndix A: Focus on	linear and expon	ential.							
linear and expon	ential.									
Make sense of	Reason abstractly	Construct viable	Model with	Use appropriate	Attend to	Look for and make	Look for and			
problems and	and quantitatively.	arguments and	mathematics.	tools strategically.	precision.	use of structure.	express regularity			
persevere in solving them.		critique the reasoning of					in repeated reasoning.			
SOIVING LITERII.		others.					reasoning.			

Grade Level/ Co	ourse: Algebra I Unit 2
Standard with code:	F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*(*Modeling standard)
Domain:	Interpreting Functions
Cluster:	Interpret functions that arise in applications in terms of a context
Type:H	KnowledgeXReasoningPerformance SkillProduct

Knowledge Targ	ets		Reasoning Targets	;		Performance	Skills Targets	<b>Product Targets</b>
Given the graph or a verbal/written description of a function, identify and describe the domain of the function.			Relate the domain of the function to its graph and, where applicable, to the quantitative relationship it describes.					
Identify an appropriate domain based on the unit, quantity, and type of function it describes.			Explain why a domain is appropriate for a given situation.					
	dix A: For F.IF.4 and I							
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.		nd to ision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Standard with	F.IF.6 Calculate and	d interpret the a	verage rate of cha	ange of a function	(presented sym	bolically or as	a table)					
Code:		over a specified interval. Estimate the rate of change from a graph.*(Modeling standard)										
Domain:	Interpreting Functi	nterpreting Functions										
Cluster:		nterpreting Functions nterpret functions that arise in applications in terms of a context										
	wledge <u>X</u> Reas		erformance Skill	Product								
Knowledge Targets	3	Reasoning Targe	ts	Performance Skill	Targets	Product Targ	ets					
Recognize slope as	an average rate of	Interpret the ave	rage rate of									
change.		change of a func	tion (presented									
Calculate the avera	ge rate of change of	symbolically or a	· · · · · · · · · · · · · · · · · · ·									
	ed symbolically or as	specified interva	l.									
a table) over a spec	•											
a table, over a spec	anca meer van											
Estimate the rate o	f change from a											
linear or exponenti	al graph.											
Notes from Append	dix A: Focus on linear											
functions and expo	nential functions											
whose domain is a	subset of the											
integers. Unit 5 of t	he Traditional											
,	and the Traditional											
•	address other types											
of functions.												
Make sense of	Reason abstractly and	Construct viable	Model with	Use appropriate	Attend to	Look for and	Look for and					
problems and	quantitatively.	arguments and	mathematics.	tools strategically.	precision.	make use of	express					
persevere in solving them.		critique the reasoning of				structure.	regularity in repeated					
uiciii.		others.					repeated reasoning.					

Grade Level/ C	rade Level/ Course: Algebra 1 Unit 2								
Standard with code:									
Domain:	Interpreting Functions								
Cluster:	Analyze functions using different representations								
Type: X	KnowledgeReasoningPerformance SkillProduct								

Knowledge Targe	ets	Reasoning Targe	ets			Performance	Skills Targets	Product Targets
Graph linear fund simple cases or u for more complic show/label intere- graph.  Note from Apper linear functions.	ctions by hand in sing technology cated cases and cepts of the addix A: Focus	neasoning raige	:15			Periormance	: Julis Talgets	Froduct raigets
comparisons of t presented algebrexample, compa- functions.	aically. For							
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Atten precis		Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ Co	ourse: Algebra 1 Unit 2							
Standard with code:	F.IF.7e Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*(Modeling standard) e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.							
Domain:	Interpreting Functions							
Cluster:	Analyze functions using different representations							
Туре:I	Type:KnowledgeXReasoningPerformance SkillProduct							

Knowledge Tar	gets	Reasoning Targ	gets			Performand	ce Skills	<b>Product Targets</b>
Graph exponent hand in simple c technology for n cases, and show end behavior.	ases or using nore complicated	complicated line	ifferences betwee ar and exponentia technology is appr	l functions and kno	ow	Targets		
Note from Appendix A: Focus on linear and exponentials functions. Include comparisons of two functions presented algebraically. For example, compare the growth of two linear functions, or two exponential functions such as y=3 <sup>n</sup> and y=100 <sup>2</sup> .								
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.		nd to ision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in ables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for nother, say which has the larger maximum.						
_						

Knowledge Targ	ets		Reasoning Targets		Performand	e Skills Targets	Product Targets
Identify types of numerical, algebrand state key properties, average rates, average (graphically, verbalgebraically)  Note from Appe exponential functions present compare the groups of the properties of the propertie	functions based or functions based or traic, and graphical operties (e.g. interdites of change, and tween exponential a variety of descriptionally, numerically, and the complete algebraically. From the descriptions of two linear functions such as y	n verbal, descriptions tepts, growth end behaviors) and linear tors and ear and parisons of two for example, unctions, or	Use a variety of fur representations (a graphically, numer verbal descriptions contrast properties	nction gebraically, ically in tables, or b ) to compare and			
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ (	Grade Level/ Course (HS): Algebra 1 Unit 2						
Standard	.BF.1a Write a function that describes a relationship between two quantities.*(Modeling standard)						
with code:	a. Determine an explicit expression, a recursive process, or steps for calculation from a context.						
Domain:	Building Functions						
Cluster:	Build a function that models a relationship between two quantities						
Туре:	KnowledgeXReasoningPerformance SkillProduct						

Knowledge Targ	gets	Reasoning Targets				Skills	Produ	ct Targets
Define "explicit in the control of t		Write a function the between two quant expression, a recurs	tities by detern	nining an explicit				
Note from Appendix A: Limit to F.BF.1a to linear and		calculation from a c						
exponential fund	ctions	Note from Appendi and exponential fu		RF. TA TO linear				
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and ma use of structure	. 1	Look for and express regularity in repeated reasoning.

Grade Level/	Course (HS): Algel	bra 1 Unit 2									
Standard with code:	b. Combine stan	F.BF.1b Write a function that describes a relationship between two quantities.*(Modeling standard) b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.									
Domain:	Building Functio	ns									
Cluster:	Build a function	that models a relation	ship between two	quantities							
Туре:	_Knowledge _	XReasoning _	Performan	ce Skill	Product						
Knowledge Tai	gets	Reasoning Targets	easoning Targets				Prod	uct Targets			
operations of a subtraction, me division Evaluate the do combined func Note from App	ultiplication, and omain of the	<ul> <li>relationships/ qual</li> <li>determine which a performed to build function, and</li> </ul>	ctions to represent ntities, rithmetic operation I the appropriate co	should be mbined ontext of the							
Make sense of problems and persevere in solvir them.	Reason abstractly and quantitativeling	*	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and use of struct		Look for and express regularity in repeated reasoning.			

Grade Level/ Co	Grade Level/ Course (HS): Algebra 1 Unit 2							
Standard with code:	F.BF.2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*(*Modeling standard)							
Domain:	Building Functions							
Cluster:	Build a function that models a relationship between two quantities							
Type:KnowledgeXReasoningPerformance SkillProduct								

Knowledge Targe	ets		Reasoning Targe	ts		Performance	Product Targets
					Skills Targets		
Identify arithmet	ic and geometric p	atterns in given	Use given and co	nstructed arithme	tic and		
sequences.				nces, expressed bo	•		
Generate arithmerecursive and exp	etic and geometric plicit formulas.	sequences from	and with explicit situations.	formulas, to mode			
	etic or geometric se ranslate into the ex	•	Determine the regeometric seque	ecursive rule given nces.			
	Given an arithmetic or geometric sequence as an explicit formula, translate into the recursive form.			xplicit formula give equences.			
sequences to line	Notes from Appendix A: Connect arithmetic sequences to linear functions and geometric sequences to exponential functions.			ation between the ormula for arithme nces.			
			sequences to line	endix A: Connect a ear functions and a conential functions	geometric		
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Domain: Building Functions	
Cluster: Build new functions from existing functions	

Knowledge	Knowledge Targets Reasoning Targets							ince gets	Product Targets
Given a single transformation o function (symbol	ic or	trans	Describe the differences and similarities between a parent function and the transformed function.						
graphic) identify effect on the gra			Find the value of k, given the graphs of a parent function, $f(x)$ , and the transformed function: $f(x) + k$ , k $f(x)$ , $f(kx)$ , or $f(x + k)$ .						
Using technology	· ·	Reco	Recognize even and odd functions from their graphs and from their equations.						
identify effects of single transformations on graphs of functions.		•	Experiment with cases and illustrate an explanation of the effects on the graph using technology.						
Graph a given function by replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative).		expo inter at thi	s from Appendix A: F nential functions. Rel cept. While applying is level, it may be diff ffects of the other tr	late the vertical tra other transforma icult for students	anslation of a linea tions to a linear gra to identify or distin	r function to its y- aph is appropriate guish between			
Make sense of problems and persevere in solving them.	problems and abstractly an quantitativel		Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	expr	of for and ress regularity in reated reasoning.

Grade Level/	Grade Level/ Course (HS): Algebra 1 Unit 2							
Standard with code:	F.LE.1a Distinguish between situations that can be modeled with linear functions and with exponential functions.  a. Prove that linear functions grow by equal differences over equal intervals; and that exponential functions grow by equal factors over equal intervals.							
Domain:	Linear, Quadratic, and Exponential Models *(*Modeling Domain)							
Cluster:	Construct and compare linear and exponential models and solve problems							
Туре:	Knowledge X Reasoning Performance Skill Product							

Knowledge Tar	owledge Targets Reasoning Targets				Performand Targets	ce Skills	Product Targets	
Recognize that line by equal difference intervals.	_	linear functions ar	en situations that cand with exponential for real-world problem	functions to solve				
Recognize that exp grow by equal factor intervals.		equal intervals.		ual differences over				
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.		nd to cision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/	Course (HS): Algeb	ora 1 Unit 2						
Standard	_			be modeled with li			-	
with code:	b. Recognize situ	ations in which	one quantity cha	anges at a constan	nt rat	te per unit ir	nterval relative	to another.
Domain:	Linear, Quadrati	c, and Exponenti	ial Models *(*M	lodeling Domain)				
Cluster:	Construct and co	ompare linear, qu	uadratic, and ex	ponential models	and	solve proble	ems	
Type:X_	Knowledge	Reasonin	gPer	formance Skill		Product		
Knowledge Ta	ırgets	Reasoning Targ	gets			Performand	ce Skills	<b>Product Targets</b>
Docogniza city	iono in which	+				Targets		
_	lations in which							
one quantity of	•							
	per unit (equal							
· ·	nterval relative to							
	ve mathematical							
and real-world	d problems.							
Make sense of	Reason abstractly	Construct viable	Model with	Use appropriate		end to	Look for and make	
problems and persevere in	and quantitatively.	arguments and critique the	mathematics.	tools strategically.	prec	cision.	use of structure.	express regularity in repeated

reasoning of

others.

solving them.

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reasoning.

Grade Level/	Course (HS): Algel	ora 1 Unit 2								
Standard with code:	_	LE.1c Distinguish between situations that can be modeled with linear functions and with exponential functions.  Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to nother.								
Domain:	Linear, Quadrati	c, and Exponent	ial Models *(*Mo	odeling Domain)						
Cluster:	Construct and co	ompare linear, qu	uadratic, and exp	onential models	and	solve proble	ems			
Type:X_	Knowledge	Reasonin	gPerf	ormance Skill		Product				
Knowledge Ta	irgets	Reasoning Tar	gets			Performand Targets	ce Skills	Product Targets		
quantity grow constant perce (equal factors to another to	rations in which a s or decays by a ent rate per unit ) interval relative solve and real-world									
Make sense of problems and persevere in	Reason abstractly and quantitatively.	Construct viable arguments and critique the	Model with mathematics.	Use appropriate tools strategically.		end to cision.	Look for and make use of structure.	Look for and express regularity in repeated		

reasoning of

others.

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reasoning.

Grade Level	Course (HS): Algebra 1 Unit 2							
Standard with code:	F.LE.2 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).							
Domain:	Linear, Quadratic, and Exponential Models *(Modeling Domain)							
Cluster:	Construct and compare linear, quadratic, and exponential models and solve problems							
Туре:	KnowledgeXReasoningPerformance SkillProduct							
Vnowledge Te	Posconing Targets   Deviate   Deviat							

Knowledge Targets			Reasoning Targets			Performance	e Skills Targets	Product Targets	
Recognize arithmetic sequences can be			Determine when a graph, a description of a						
expressed as linear functions.			relationship, or two input-output pairs						
Recognize geometric sequences can be expressed as exponential functions.			(include reading these from a table) represents a linear or exponential function in order to solve problems.						
Construct linear functions, including arithmetic sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).									
Construct exponential functions, including geometric sequences, given a graph, a description of a relationship, or two inputoutput pairs (include reading these from a table).									
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.		Model with mathematics.	Use appropriate tools strategically.		end to cision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/	Course (HS): Algebra 1 Unit 2
Standard with code:	F.LE.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.
Domain:	Linear, Quadratic, and Exponential Models *(Modeling Domain)
Cluster:	Construct and compare linear, quadratic, and exponential models and solve problems
Туре:	KnowledgeXReasoningPerformance SkillProduct

Knowledge Ta	rgets	Reasoning Targ	Reasoning Targets			Skills Targets	Product Targets
1	Informally define the concept of "end behavior".  Compare tables and graphs of linear and exponential functions to observe that a quantity increasing exponentially exceeds all others to solve mathematical and real-world problems.  Note from Appendix A: Limit to comparisons between linear and exponential models.						
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/	Course (HS): Algel	bra 1 Unit 2							
Standard with code:	F.LE.5 Interpret	F.LE.5 Interpret the parameters in a linear or exponential function in terms of a context.							
Domain:	Linear, Quadrati	ic, and Exponenti	al Models *(Mo	deling Domain)					
Cluster:	Interpret expres	sions for functio	ns in terms of th	ne situation they	model				
Туре:	_Knowledge _	XReasonin	gPer	formance Skill	Product				
Knowledge Ta	rgets	Reasoning Targ	gets		Performance S	kills Targets	<b>Product Targets</b>		
Recognize the parameters in a linear or exponential function including: vertical and horizontal shifts, vertical and horizontal dilations.  Recognize rates of change and intercepts as "parameters" in linear or exponential functions.		· ·	arameters in a li nction in terms c						
Make sense of problems and persevere in	Reason abstractly and	Construct viable arguments and critique the	Model with mathematics.	Use appropriate tools	Attend to precision.	Look for and make use of structure.	Look for and express		

reasoning of

others.

solving them.

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repeated

reasoning.

Grade Level/ Co	Grade Level/ Course: Algebra 1 Unit 3					
Standard with code:	ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots). itatistics and Probability is a Modeling Conceptual Category.)					
Domain:	Interpreting Categorical and Quantitative Data					
Cluster:	Summarize, represent, and interpret data on a single count or measurement variable					
Type: _X_ KnowledgeReasoningPerformance SkillProduct						

Knowledge Targe	ets	Reasoning Target	s		Perfor	rmance Skills Targets	<b>Product Targets</b>
Represent data we real number line display types by or plots, histograms	vith plots on the using various creating dot	neusoning runger					Trouder range to
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/	Course: Algebra 1 Unit 3
Standard with code:	S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.  (Statistics and Probability is a Modeling Conceptual Category.)
Domain:	Interpreting Categorical and Quantitative Data
Cluster:	Summarize, represent, and interpret data on a single count or measurement variable
Туре:	KnowledgeXReasoningPerformance SkillProduct

Knowledge	Targets	Reasoning <sup>*</sup>	Targets			Perform Targets	nance Skills	Product Targets
they choose a su appropriate to the	e center and distribution. Here mmary statistic ne characteristics bution such as the ribution or the	median) and spre deviation) based	opriate measure for ead (interquartile) on the shape of a statistics for center more data sets.	range, standard data distribution.				
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Atter preci		Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/	Course: Algebra 1 Unit 3
Standard with code:	S.ID.3 Interpret differences in shape, center and spread in the context of data sets, accounting for possible effects of extreme data points (outliers).  (Statistics and Probability is a Modeling Conceptual Category.)
Domain:	Interpreting Categorical and Quantitative Data
Cluster:	Summarize, represent, and interpret data on a single count or measurement variable
Туре:	KnowledgeXReasoningPerformance SkillProduct

Knowledge Tar	gets	Reasoning Targ	gets		Performance :	Skills Targets	Product Targets
Define "the cor	ntext of data	Interpret differ	ences in shape, c	enter and spread			
sets" as meanir	ng the specific ttributes under	in the context of	of data sets.				
investigation.		Describe the po	ossible effects the	e presence of			
		outliers in a set	of data can have	e on shape,			
		center, and spr	ead in the contex	xt of the data			
		sets.					
Naka sanas af	December about the	Constant debt	Model with	l la annuaniate	O the real tree	Look for and make	Laglifarand
Make sense of problems and	Reason abstractly and quantitatively.	Construct viable arguments and	mathematics.	Use appropriate tools strategically.	Attend to precision.	use of structure.	Look for and express regularity
persevere in		critique the					in repeated
solving them.		reasoning of others.					reasoning.

Standard with code:	in the context of associations and	S.ID.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal and conditional relative frequencies). Recognize possible associations and trends in the data. (Statistics and Probability is a Modeling Conceptual Category.)						
Domain:	Interpreting Cat	egorical and Qua	intitative Data					
Cluster:	Summarize, repi	resent, and inter	pret data on two	categorical and	quar	ntitative vari	ables	
Туре:	Knowledge _	XReasonin	gPerfo	ormance Skill		Product		
Knowledge Ta	irgets	Reasoning Targe	ets			Performance	e Skills Targets	<b>Product Targets</b>
conditional re Calculate relat including joint conditional re	•	Recognize possil	ble associations and	d trends in the dat	а.			
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of	Model with mathematics.	Use appropriate tools strategically.		end to cision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

others.

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Standard with code:	a. Fit a function	S.ID.6a Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.  a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models.  (Statistics and Probability is a Modeling Conceptual Category.)							
Domain:	Interpre	eting Categorical and Quantitative Data							
Cluster:	Summa	rize, represent, and interpret data on two categorical and qua	ntitative variables.						
Туре:	Knowled	dgeXReasoningPerformance Skill	_Product						
Knowledge Ta	rgets	Reasoning Targets	Performance Skills Targets	Product Targets					
Represent da scatter plot (2 quantitative variables). Fit a given fur class (e.g. line exponential)	2 nction ear,	Using given scatter plot data represented on the coordinate plane, informally describe how the two quantitative variables are related.  Determine which function best models scatter plot data represented on the coordinate plane, and describe how the two quantitative variables are related.  Use functions fitted to data to solve problems in the context of the data.  From Appendix A: Students take a more sophisticated look at using a linear function to model the relationship between two numerical variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals.							

Reason abstractly

and quantitatively.

Construct viable

arguments and

critique the

reasoning of

others.

Make sense of

problems and

persevere in

solving them.

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Model with

mathematics.

Use appropriate

tools strategically.

Attend to

precision.

Look for and make

use of structure.

Look for and

in repeated

reasoning.

express regularity

Grade Level/	Grade Level/ Course: Algebra 1 Unit 3					
Standard with code:	S.ID.6b Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. b. Informally assess the fit of a function by plotting and analyzing residuals. (Statistics and Probability is a Modeling Conceptual Category.)					
Domain:	Interpreting Categorical and Quantitative Data					
Cluster:	Summarize, represent, and interpret data on two categorical and quantitative variables.					
Туре:	Type:KnowledgeX_ReasoningPerformance SkillProduct					

Knowledge Targe	ts	Reasoning Targe	ets			Performance	e Skills Targets	<b>Product Targets</b>
Represent the residuals from a function and the data set it models numerically and graphically.  From Appendix A: Students take a more sophisticated look at using a linear function to model the relationship between two numeric variables. In addition to fitting a line to data, students assess how well the model fits by analyzing residuals. Focus on linear models, however, this standard could also preview quadratic functions in Unit 5 of Algebra I.			e a more ear function to two numerical line to data, odel fits by ear models, so preview	g	Terrormance	z skiiis Turgets	Troduce raigets	
Make sense of problems and persevere in so lving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Atter preci		Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/	Grade Level/ Course: Algebra 1 Unit 3					
Standard with code:	S.ID.6c Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. c. Fit a linear function for a scatter plot that suggests a linear association. (Statistics and Probability is a Modeling Conceptual Category.)					
Domain:	Interpreting Categorical and Quantitative Data					
Cluster:	Summarize, represent, and interpret data on two categorical and quantitative variables.					
Туре:	Knowledge _X_ReasoningPerformance SkillProduct					

<b>Knowledge Targets</b>	R	Reasoning Targets			Perf	formance S	kills Targets	Product Targets
From Appendix A: It of Middle School, st were creating scatted recognizing linear to data. This unit build prior experience, prestudents with more means of assessing model fits data.	er plots and rends in ds upon that roviding	it a linear function for uggests a linear associ	-	hat				
	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriat tools strategica		Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/	Grade Level/ Course: Algebra 1 Unit 3					
Standard with code:	S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.  (Statistics and Probability is a Modeling Conceptual Category.)					
Domain:	Interpreting Categorical and Quantitative Data					
Cluster:	Interpret linear models.					
Туре:	Knowledge <u>X</u> ReasoningPerformance SkillProduct					

Knowledge Targ	ets	Reasoning Targe	ets			Performance	e Skills Targets	Product Targets
From Appendix students' work relationships in	A: Build on with linear	Interpret the sl	ope (rate of chan tant term) of a lii	ige) and the near model in the	•	Terrormance	z Janis Targets	Troduct raigets
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Atten		Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/	Grade Level/ Course: Algebra 1 Unit 3					
Standard with code:	S.ID.8 Compute (using technology) and interpret the correlation coefficient of a linear fit. (Statistics and Probability is a Modeling Conceptual Category.)					
Domain:	Interpreting Categorical and Quantitative Data					
Cluster:	Interpret linear models.					
Type:Knowledge _X_ReasoningPerformance SkillProduct						

Knowledge Tar	gets	Reasoning Targ	Reasoning Targets			Performand Targets	ce Skills	Product Targets
Compute (using technology) the correlation coefficient of a linear fit.  Define the correlation coefficient.		Interpret the correlation coefficient of a linear fit as a measure of how well the data fit the relationship.  From Appendix A: Build on students' work with linear relationships in eighth grade and introduce the correlation coefficient. The focus here is on the computation and interpretation of the correlation coefficient as a measure of how well the data fit the relationship. The important distinction between a statistical relationship and a cause-and-effect relationship arises in S.ID.9.  Construct viable Model with Use appropriate Atter						
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.		nd to cision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/	Course: Algebra I Unit 3					
Standard	S.ID.9 Distinguish between correlation and causation.					
with code:	(Statistics and Probability is a Modeling Conceptual Category.)					
Domain:	Interpreting Categorical and Quantitative Data					
Cluster:	Interpret Linear Models					
Туре:	KnowledgeXReasoningPerformance SkillProduct					

Knowledge Ta	rgets	Reasoning Targets				Performano Targets	ce Skills	Product Targets
Define positive, negative, and no correlation and explain why correlation does not imply causation.  Define causation.  Make sense of Reason abstractly		Distinguish between correlation and causation.  From Appendix A: Build on students' work with linear relationships in eighth grade and introduce the correlation coefficient. The focus here is on the computation and interpretation of the correlation coefficient as a measure of how well the data fit the relationship. The important distinction between a statistical relationship and a cause-and-effect relationship arises in S.ID.9.						
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.		nd to ision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ Co	Grade Level/ Course (HS): Algebra 1 Unit 4					
Standard with code:	A.SSE.1a Interpret expressions that represent a quantity in terms of its context.* (*Modeling standard) a. Interpret parts of an expression, such as terms, factors, and coefficients.					
Domain:	Seeing Structure in Expressions					
Cluster:	Interpret the structure of expressions					
Туре:I	Knowledge X Reasoning Performance Skill Product					

Knowledge Tar	gets	Reasoning Targe	ets			Performance	e Skills Targets	Product Targets
For expressions	that represent a	For expressions	that represent a co	ontextual quantity,				
contextual quai	ntity, define and	interpret parts o	f an expression, su	ich as terms, factor	rs,			
recognize parts	of an expression,	and coefficients	in terms of the cor	ntext.				
such as terms, f	factors, and							
coefficients.		Note from Appendix A: Extend to quadratic and exponential expressions						
Note from App	endix A: Extend to							
quadratic and e	exponential							
expressions								
Make sense of	Reason abstractly	Construct viable	Model with	Use appropriate	Atte	end to	Look for and make	Look for and
problems and	and quantitatively.	arguments and	mathematics.	tools strategically.	pred	cision.	use of structure.	express regularity
persevere in		critique the						in repeated
solving them.		reasoning of others.						reasoning.

Grade Level/ Co	Grade Level/ Course (HS): Algebra 1 Unit 4					
Standard with code:	a.SSE.1b Interpret expressions that represent a quantity in terms of its context.* (Modeling standard) b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1+r)^n$ as the product of P and a factor not depending on P.					
Domain:	Seeing Structure in Expressions					
Cluster:	Interpret the structure of expressions					
Type:KnowledgeXReasoningPerformance SkillProduct						

Knowledge Targ	ets	Reasoning Targe	ets			Performance	e Skills Targets	<b>Product Targets</b>
The underpinni this standard A.SSE.1a: For exrepresent a cont define and recog expression, such and coefficients.  Notes from Appel exponential and	ng knowledge for is addressed in expressions that extual quantity, gnize parts of an as terms, factors, endix A: Extend to quadratic end exponents to ats focusing on	For expressions interpret complication context, by view entity.  Notes from Appendication expressions in the complex context in the complex context.	Notes from Appendix A: Extend to exponential and quadratic expressions, extend exponents to rational exponents focusing on those that represent square or cube roots.					
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.		nd to ision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ Co	ourse: Algebra 1 Unit 4
Standard with code:	A.SSE.2 Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$ , thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$ .
Domain:	Seeing Structure in Expressions
Cluster:	Interpret the structure of expressions.
Type:I	KnowledgeX_ReasoningPerformance SkillProduct

Knowledge Targ	ets		Reasoni	ng Targets			Performance	e Skills Targets	Product Targets
Identify ways to	o rewrite expressi	ons,	Use the structure of an expression to						
such as differe	nce of squares, fac	ctoring	identify	ways to rewrite	it.				
out a common	out a common monomial, regrouping,		Cl :t						
etc. Identify various structures of expressions			Classify expressions by structure and						
		ssions	develop strategies to assist in classification.						
(e.g. an exponential monomial multiplied			Notes from Appendix A: Focus on quadratics						
by a scalar of the	by a scalar of the same base, difference of			and exponential expressions					
squares in terms	other than just x)								
1 ' '	Notes from Appendix A: Focus on quadratics and exponential expressions								
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct argument critique the reasoning others.	s and ne	Model with mathematics.	Use appropriate tools strategically.		end to cision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ (	Grade Level/ Course: Algebra 1 Unit 4								
Standard with code:	A.SSE.3a Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.*(Modeling standard)  a. Factor a quadratic expression to reveal the zeros of the function it defines.								
Domain:	Seeing Structure in Expressions								
Cluster:	Write expressions in equivalent forms to solve problems.								
Туре:	KnowledgeX_ReasoningPerformance SkillProduct								

Knowledge Targ	ets	Reasoning Targe	ets		Performance	e Skills Targets	<b>Product Targets</b>
of the original of the con between the fa quadratic expre	equivalent form expression nection ctored form of a ession and the action it defines. perties of the eented by the	quadratic expre properties of the original express Notes from Appe conceptual under work with equival development of square goes han	ession to reveal a ne quantity repression. endix A: It is imporestanding and pro- alent expressions. skill in factoring ar d-in-hand with und	nd explain sented by the tant to balance cedural fluency in For example, and completing the derstanding what			
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	 end to cision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ Co	Grade Level/ Course: Algebra 1 Unit 4									
Standard with code:	A.SSE.3b Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* (Modeling standard) b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.									
Domain:	Seeing Structure in Expressions									
Cluster:	Write expressions in equivalent forms to solve problems.									
Туре:	KnowledgeX_ReasoningPerformance SkillProduct									

Knowledge Targ	ets	Reasoning Targe	ets		Per	formance	e Skills Targets	<b>Product Targets</b>
Complete the sq quadratic expres an equivalent for expression.  Explain the connict the completed signification or minical the function it discussed in the proping quantity represents expression.	ession to produce rm of an ection between quare form of a ession and the nimum value of efines. erties of the ented by the	expression to reconceptual under work with equival development of square goes han	veal and explain prented by the original endix A: It is impostrated by the original endix A: It is impostrated and propersions and propersions and in-hand with unoting a quadratic expr	ortant to balance cedural fluency in For example, and completing the derstanding what	ic			
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.		Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/	Course: Algebra 1	Unit 4								
Standard with code:	represented by t c. Use the prope 1.15 <sup>t</sup> can be rew	A.SSE.3c Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.* (*Modeling standard) c. Use the properties of exponents to transform expressions for exponential functions. For example the expression $1.15^t$ can be rewritten as $(1.15^{1/12})^{12t} \approx 1.01212^t$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.								
Domain:	Seeing Structure	in Expressions								
Cluster:	Write expression	ns in equivalent f	forms to solve pr	oblems.						
Туре:	Knowledge	_XReasoning	Perform	mance Skill		_Product				
Knowledge Tai	rgets	Reasoning Targe	ets			Performance	Performance Skills Targets P			
Use the properties of exponents to transform simple expressions for exponential functions.  Use the properties of exponents to transform expressions for exponential functions.		Choose and produce an equivalent form of an exponential expression to reveal and explain properties of the quantity represented by the original expression.  Explain the properties of the quantity or quantities represented by the transformed exponential expression.								
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.		end to cision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.		

Grade Level/ C	Course (HS): Algeb	ora 1 Unit	4							
Standard with code:		APR.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the erations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.								
Domain:	Arithmetic with	Arithmetic with Polynomial and Rational Expressions								
Cluster:	Perform arithme	rm arithmetic operations on polynomials								
Type:X_	Knowledge	wledgeReasoningPerformance SkillProduct								
Knowledge Targ	gets	Rea	soning Targets	s			Performance	e Skills Targets	Product Targets	
product of two per a polynomial polynomials are operations of acmultiplication.  Define "closure" Apply arithmetic subtraction, and polynomials.  Note from Apper polynomial expects of forms that a	e sum, difference, or polynomials will alw l, which means that e closed under the ddition, subtraction, ".  It operations of addition to endix A: Focus on pressions that simplicate linear or quadrateger power of x.	rays, and ition,								
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct varguments critique the reasoning of	s and mathe	el with ematics.	Use appropriate tools strategically.		end to cision.	Look for and make use of structure.	Look for and express regularity in repeated	

others.

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reasoning.

Grade Level/	Course: Algebra 1 Unit 1									
Standard with code:	A.CED.1 Create equations and inequalities in one variable and use them to solve problems. <i>Include equations arising from linear and quadratic functions, and simple rational and exponential functions.</i>									
Domain:	Creating Equations* (*Modeling Domai	Creating Equations* (*Modeling Domain)								
Cluster:	Create equations that describe number	Create equations that describe numbers or relationships								
Туре:	KnowledgeXReasoning	Performance SkillProduct								
Knowledge T	argets	Reasoning Targets	Performance Skills Targets	Product Targets						
Solve inequal  Describe the the problem changing or gexpress these	ind exponential equations in one variable.  lities in one variable.  relationships between the quantities in (for example, how the quantities are growing with respect to each other); e relationships using mathematical ocreate an appropriate equation or solve.	Create equations (linear and exponential) and inequalities in one variable and use them to solve problems.  Create equations and inequalities in one variable to model real-world situations.  Compare and contrast problems that can be solved by different types of equations (linear & exponential).								
equations, an limit to situat	opendix A: Limit to linear and exponential and, in the case of exponential equations, cions requiring evaluation of exponential anteger inputs.									

Make sense of	Reason abstractly	Construct viable	Model with	Use appropriate	Attend to	Look for and make	Look for and
problems and	and quantitatively.	arguments and	mathematics.	tools strategically.	precision.	use of structure.	express regularity
persevere in		critique the					in repeated
solving them.		reasoning of					reasoning.
		others.					

Grade Level	Course: Algebra 1	Unit 4								
Standard:		A.CED.2 Create equations in two or more variables to represent relationships between quantities, graph equations on a coordinate axes with labels and scales.								
Domain:	Create Equations and describe*									
Cluster:	Create equation	s that describe n	umbers or relation	onships						
Туре:	Knowledge _	XReasoning	gPerfo	ormance Skill		Product				
Knowledge Ta	argets	Reasoning Targe	ets			Performanc	e Skills Targets	Product Targets		
Identify the quantities in a mathematical problem or real-world situation that should be represented by distinct variables and describe what quantities the variables represent.  Graph one or more created equation on a coordinate axes with appropriate labels and scales.  Appendix A: the targets extend work on linear and exponential equations.  Create at least two equations in two or more variables to represent relationships between quantities  Justify which quantities in a mathematical problem or real-world situation are dependent and independent of one another and which operations represent those relationships.  Determine appropriate units for the labels and scale of a graph depicting the relationship between equations created in two or more variables.				of						
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of	Model with mathematics.	Use appropriate tools strategically.		nd to sision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.		

others.

Grade Level/ Course: Algebra 1 Unit 4								
Standard:	A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.  For example, rearrange Ohm's law V = IR to highlight resistance R.							
Domain:	Creating Equations* (*Modeling Domain)							
Cluster:	Create equations that describe numbers and relationships							
Туре:	Type:KnowledgeX_ ReasoningPerformance SkillProduct							

Knowledge Targe	ets	Reasoning Targe	ets			Performance	e Skills Targets	<b>Product Targets</b>
Define a "quantity mean any numer quantity (e.g.2 $\left(\frac{r}{2}\right)$ is the quantity of that d must be evand $\pi r^2 h = V_{cyl}$	by of interest" to ical or algebraic $\binom{n}{2} = d$ , in which 2 interest showing ven; $\frac{\pi r^2 h}{3} = V_{cone}$ inder showing	value are assoning as in solving equations. (e.g. $\pi * r^2$ can be re-written as $(\pi * r) * r$ which makes the form of this expression resemble b*h.)					J	J
that $V_{cylinder} = 1$ From Appendix A to formulas involvariables.	a: Extend A.CED.4							
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.		nd to ision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ Course: Algebra 1 Unit 4								
Standard with code:	A.REI.4a Solve quadratic equations in one variable.  a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x-p) <sup>2</sup> =q that has the same solutions. Derive the quadratic formula from this form.							
Domain:	Reasoning with Equations and Inequalities							
Cluster:	Solve equations and inequalities in one variable.							
Type:k	KnowledgeX_ReasoningPerformance SkillProduct							

Knowledge Targets			Reasoning Targets			Performance Skills Targets		Product Targets	
Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x-p)^2 = q$ that has the same solutions.				the quadratic forr uare on a quadrati	mula by completing ic equation in x.	5	-		
Solve quadratic equations in one variable.  Notes from Appendix A: Students should learn of the existence of the complex number system, but will not solve quadratics with complex solutions until Algebra II.									
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct vi arguments a critique the reasoning o others.	and	Model with mathematics.	Use appropriate tools strategically.		nd to ision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ Course: Algebra 1 Unit 4								
Standard with code:	A.REI.4b Solve quadratic equations in one variable. b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$ ), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers $a = a + bi$							
Domain:	Reasoning with Equations and Inequalities							
Cluster:	Solve equations and inequalities in one variable.							
Type:I	KnowledgeX_ReasoningPerformance SkillProduct							

Knowledge Targets Reasoning Targets						Performance	e Skills Targets	Product Targets
Solve quadratic e inspection (e.g., taking square root the square, the cand factoring	equations by for $x^2 = 49$ ), ots, completing quadratic formula solutions as a $\pm$ bi	Determine approtage target listed) to sequations, as apequation.  Recognize when solutions.  Note from Appelexistence of the	opriate strategies (solve problems inverselved) propriate to the inthe the quadratic formation A: Students showing the complex numbers	itial form of the mula gives complex	t			
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.		end to cision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ Course: Algebra 1 Unit 4										
Standard with code:	A.REI.7 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$ .									
Domain:	Reasoning with Equations and Inequalities									
Cluster: Type: X	Solve systems of equations  KnowledgeReasoningPerformance SkillProduct									

Knowledge Targ	ets		Reasoning Targets			Performance	e Skills Targets	Product Targets	
Transform a simple system consisting of a linear equation and a quadratic equation in 2 variables so that a solution can be found algebraically and graphically.  Notes from Appendix A: Include systems consisting of one linear and one quadratic equation. Include systems that lead to work with fractions. For example, finding the			Expla algeb syste	in the correspondoral sc	olutions to a simple Inear equation and		renomiano	C James Targets	Troduct raigets
intersections betoever $=\frac{x+1}{2}$ leads to	tween $x^2 + y^2 = 1$ the point $(\frac{3}{5}, \frac{4}{5})$ ding to the Pythago	and y on the unit							
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct vial arguments an critique the reasoning of others.		Model with mathematics.	Use appropriate tools strategically.		end to cision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/Co	ourse (HS): Algeb	ra 1 Unit 5									
Standard with Code:	and an irratio	RN.3 Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational umber is irrational.									
Domain:	The Real Num	ne Real Number System									
Cluster:	Use propertie	s of rational and	irrational numbe	rs.							
Type:Kn	owledge X	Reasoning	Performance	SkillProd	uct						
Knowledge Tar	gets	Reasoning Targ	ets	Performance Sk	ill Targets	Product Target	S				
Find the sums and products of rational and irrational numbers.  Recognize that the sum of a rational number and an irrational number is irrational.  Recognize that the product of a nonzero rational number is irrational an irrational number is irrational.		Explain why rat are closed under multiplication.  Note from Appe Connect N.RN.3 situations, e.g., perimeter of a s	er addition or endix A: B to physical finding the square of area 2.								
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.				

Grade Level/Cours	o (high School): /	Ngohra I IInit E											
Standard with	trade Level/Course (high School): Algebra I Unit 5 tandard with F.IF.4 For a function that models a relationship between two quantities, interpret key features of graphs and tables in												
Code:		terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. <i>Key</i>											
	features includ	features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative											
	maximums and	maximums and minimums; symmetries; end behavior; and periodicity.*(Modeling standard)											
Domain:	Interpreting F	Interpreting Functions											
Cluster:	· · · · · · · · · · · · · · · · · · ·		applications in terr										
Type:Knowl	<u> </u>		Performance Skill	Product		Γ							
Knowledge Tar		Reasoning Ta		Performance	Skill Targets	Product Targ	gets						
· •	nd graphs of and quadratic		ctions in the textual quantities										
linear, exponential, and quadratic functions: intercepts; intervals where the function is increasing, decreasing, positive, or negative, relative maximums and minimums, symmetries, and end behavior.  Identify whether the function is linear, exponential, or quadratic, given its table or graph.		a relationship be quantities from a description of the Notes from Appe	owing key ction that models tween two a given verbal e relationship. endix A: Focus on ons; compare with ential functions										
	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.						

Grade Level/ Co	Grade Level/ Course: Algebra 1 Unit 5								
Standard with code:	F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.*(Modeling standard)								
Domain:	Interpreting Functions								
Cluster:	Interpret functions that arise in applications in terms of a context								
Type:H	Knowledge X_ReasoningPerformance SkillProduct								

<b>Knowledge Targets</b>			<b>Reasoning Targets</b>		Performar	nce Skills Targets	Product Targets
Given the graph or a verbal/written description of			Relate the domain	of a function to its			
a function, identify a	and describe the	domain of the	graph and, where a	applicable, to the			
function.			quantitative relation	nship it describes.			
Identify an appropria			Explain why a dom	• • • •	for		
quantity, and type of	of function it des	cribes.	a given real-world	situation.			
Note from Appendix functions; compare v functions studied in	with linear and						
	eason abstractly nd quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/Cou	rse (high Schoo	l): Algebra 1 Uni	t 5							
Standard with	F.IF.6 Calcula	F.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table)								
Code:	over a specif	ied interval. Estii	mate the rate of o	change from a gr	aph.*(Modeling s	tandard)				
Domain:	Interpreting	Functions								
Cluster:	Interpret fun	ctions that arise	in applications in	terms of a conte	ext					
Type:Kno	wledge X	Reasoning	Performance S	SkillProd	luct					
Knowledge Targe	ets	Reasoning Targ	ets	Performance Sk	cill Targets	Product Target	s			
Recognize slope as	an average rate	Interpret the ave	rage rate of							
of change.		change of a funct	tion (presented							
Cala lata tha a sau		symbolically or as	s a table) over a							
Calculate the avera	_	specified interval	l <b>.</b>							
change of a function (presented symbolically or as a table) over a specified interval.  Estimate the rate of change from a linear, exponential, or quadratic graph.  Note from Appendix A: Foo quadratic functions; comparison and exponential functions and exponential functions.  Algebra 1 Pathway.			ons; compare with ential functions of the Traditional							
Make sense of	Reason abstractly	Construct viable	Model with	Use appropriate	Attend to	Look for and make	Look for and			
	and quantitatively.	arguments and	mathematics.	tools strategically.	precision.	use of structure.	express regularit			
persevere in		critique the					in repeated			
solving them.		reasoning of others.					reasoning.			

Grade Level/	Course: Algebra 1	Unit 5							
Standard with code:	-	F.IF.7a Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*(Modeling standard)  a. Graph linear and quadratic functions and show intercepts, maxima, and minima.							
Domain:	Interpreting Fun	ctions							
Cluster:	Analyze function	s using different	trepresentations						
Туре:	Knowledge	X Reasonin	gPerfo	ormance Skill		Product			
Knowledge Ta	rgets	Reasoning Targe	ets			Performance	e Skills Targets	<b>Product Targets</b>	
or using technology complicated ca	nand in simple cases ology for more ases, and show/label exima, and minima of	•	•	d quadratic functio ogy is appropriate.	ns				
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of	Model with mathematics.	Use appropriate tools strategically.		l end to cision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.	

others.

Grade Level/ Co	Grade Level/ Course: Algebra 1 Unit 5						
Standard with code:	F.IF.7b Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.*(Modeling standard)  b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.						
Domain:	Interpreting Functions						
Cluster:	Analyze functions using different representations						
Type:I	KnowledgeXReasoningPerformance SkillProduct						

Knowledge Targe	ets		Reasoning Targets				Perforn Targets	nance Skills	Product Targets
defined functions and absolute valuations simple cases or uncomplicated cases features of the grant with the grant absolute defined functions exponential functions and domain, range, a	ot, cube root, and ps, including step furuse functions, by had sing technology for es, and show/label raph.  Indix A: Compare a evalue, step and piss with linear, quadrations. Highlight issued usefulness where wise defined funct	nctions nd in r more key  nd ecce-wise ratic, and ues of n	comp root, step f know Comp absol	licated linear, qua and piecewise-def unctions and abso when the use of t pare and contrast t ute value, step and	ce between simple dratic, square root ined functions, inculute value function echnology is appropriate domain and rared piece-wise define uadratic, and expon	, cube luding ns and opriate. nge of			
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct vial arguments an critique the reasoning of others.		Model with mathematics.	Use appropriate tools strategically.	Attend to precision.		Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Standard with	F.IF.8a Write	IF.8a Write a function defined by an expression in different but equivalent forms to reveal and explain							
Code:		fferent properties of the function.							
	a. Use the pro	cess of factoring	and completing	the square in a q	uadratic functio	n to show zeros,	extreme		
	values, and sy	mmetry of the g	raph, and interp	ret these in terms	of a context.				
Domain:	Interpreting F	unctions							
Cluster:	Analyze funct	ions using differ	ent representation	ons.					
Type:Kno	wledge <u>X</u> R	easoning	Performance SI	killProduc	t				
Knowledge Targ	ets	Reasoning Targ	ets	Performance Sk	ill Targets	Product Target	S		
Identify different quadratic express Write functions in forms using the prefactoring Identify zeros, extra symmetry of the graduadratic function	equivalent rocess of reme values, and graph of a	Interpret differer forms of a function expression in term.  Use the process of completing the sequadratic function extreme values, at the graph, and in terms of a context.  Note from Appear work with quadratic the relationship is coefficients and ronce roots are known and the requation can be sequation can be sequated.	on defined by an ms of a context of factoring and quare in a on to show zeros, and symmetry of terpret these in xt.  Indix A: Extend actics to include between roots, and that hown, a quadratic						
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.		

Grade Level/ Co	ourse (HS): HS Algebra 1 Unit 5				
Standard with code:	F.IF.8b Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function:  b. Use the properties of exponents to interpret expressions for exponential functions. For example: identify percent rate of change in functions such as $y = (1.02)^t$ , $y = (0.97)^t$ , $y $				
Domain:	Interpreting Functions				
Cluster:	Cluster: Analyze functions using different representations				
Type:I	Knowledge X Reasoning Performance Skill Product				

Knowledge Targe	ets		Reaso	ning Targets		Performance	e Skills Targets	Product Targets
Classify the expo	nential function as	exponential	Use th	ne properties of	exponents to			
growth or decay	by examining the b	oase.	interp	ret expressions	for exponential			
			function	ons in a real-wo	orld context.			
			extend	ds the work beg ential functions	A: Note this unit gun in Unit 2 on s with integer			
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.		odel with Ithematics.	Use appropriate tools strategically.	end to cision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Standard with code:	F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.
Domain:	Interpreting Functions
Cluster:	Analyze functions using different representations
Туре:	KnowledgeXReasoningPerformance SkillProduct

Knowledge Targ	ets		Reasoning Targets		Perfor	mance Skills Targets	Product Targets
Identify types of functions based on verbal, numerical, algebraic, and graphical descriptions and state key properties (e.g. intercepts, maxima, minima, growth rates, average rates of change, and end behaviors)			Use a variety of fur representations (a graphically, numer verbal descriptions contrast properties	lgebraically, ically in tables, or b s) to compare and	ру		
Differentiate between exponential, linear, and quadratic functions using a variety of descriptors (graphically, verbally, numerically, and algebraically)							
types of function exponential, and quadratics to ind coefficients and	ndix A: Focus on ex ns considered to ind I quadratic. Extend clude the relationsh roots, and that onc atic equation can be	clude, linear, work with hip between te roots are					
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ (	Grade Level/ Course (HS): Algebra 1 Unit 5						
Standard with code:	F.BF.1a Write a function that describes a relationship between two quantities.*(Modeling standard) a. Determine an explicit expression, a recursive process, or steps for calculation from a context.						
Domain:	Building Functions						
Cluster:	Build a function that models a relationship between two quantities						
Туре:	Knowledge XX ReasoningPerformance SkillProduct						

<b>Knowledge Targets</b>	Re	easoning Targets			Perfo	ormance Skills 1	Targets	Proc	duct Targets
Define "explicit fun	ction" and W	rite a function that d	escribes a relation	ship					
"recursive process"		etween two quantitie pression, a recursive	, -	•					
Note from Appendi on situations that e quadratic relationsl standard builds from Unit 2.	xhibit a nip. This	Iculation from a cont	ext.						
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropri tools strategi		Attend to precision.	Look for make us structure	e of	Look for and express regularity in repeated reasoning.

Grade Level/ Co	Grade Level/ Course (HS): Algebra 1 Unit 5					
Standard with code:	F.BF.1b Write a function that describes a relationship between two quantities.*(Modeling standard) b. Combine standard function types using arithmetic operations. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.					
Domain:	Building Functions					
Cluster:	Build a function that models a relationship between two quantities					
Туре:I	KnowledgeXReasoningPerformance SkillProduct					

Knowledge Targets	Knowledge Targets Reasoning Targets					Skills Targets	Product Targets
Combine two functions using the operations of addition, subtraction, multiplication, and division  Evaluate the domain of the combined function.  Note from Appendix: Focus on situations that exhibit a quadratic relationship.		<ul> <li>Given a real-world situation or mathematical problem:         <ul> <li>build standard functions to represent relevant relationships/ quantities</li> <li>determine which arithmetic operation should be performed to build the appropriate combined function</li> </ul> </li> <li>relate the combined function to the context of the problem</li> </ul>					
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and mak use of structure.	e Look for and express regularity in repeated reasoning.

Grade Level/ Co	ourse (HS): Algebra 1 Unit 5
Standard with code:	F.BF.3 Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$ , $k$ $f(x)$ , $f(kx)$ , and $f(x + k)$ for specific values of $k$ (both positive and negative); find the value of $k$ given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
Domain:	Building Functions
Cluster:	Build new functions from existing functions
Туре:I	KnowledgeXReasoningPerformance SkillProduct

Knowledge 1	Targets	Reasoning T	argets		Perfo Targ	ormance Skills ets	Product Targets
Given a single transformation on a function (symbolic or graphic) identify the effect on the graph.  Using technology, identify effects of single transformations on graphs of functions.  Graph a given function by replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and		parent function a Find the value of function, f(x), an f(x), f(kx), or f(x - Recognize even a from their equat Experiment with the effects on th	Describe the differences and similarities between a parent function and the transformed function.  Find the value of k, given the graphs of a parent function, f(x), and the transformed function: f(x) + k, k f(x), f(kx), or f(x + k).  Recognize even and odd functions from their graphs and from their equations.  Experiment with cases and illustrate an explanation of the effects on the graph using technology.				
negative).		Note from Appendix A: focus on quadratic functions, and consider including absolute value functions.					
Make sense of problems and persevere in solving them.	Reason abstractly and quantitatively.	Construct viable arguments and critique the reasoning of others.	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in repeated reasoning.

Grade Level/ Co	Grade Level/ Course (HS): Algebra 1 Unit 5								
with code:	F.BF.4a Find the inverse functions. a. Solve an equation of the form $f(x) = c$ for a simple function $f$ that has an inverse and write an expression for the inverse. For example: $f(x) = 2x^3$ or $f(x) = (x+1)/(x-1)$ for $x \ne 1$ .								
Domain:	<b>Building Function</b>	ns							
Cluster:	Building New Fur	nctions from Exis	ting Functions						
Type:X	Knowledge	KnowledgeReasoningPerformance SkillProduct							
Knowledge Tar	gets	Reasoning Targ	ets		Performance Ski	lls Targets	<b>Product Targets</b>		
Define inverse f	function.								
Solve an equati									
f(x) = c  for a sim	•								
that has an inve									
an expression fo	or the inverse.								
Notes from Appendix A: Focus									
on linear functi	ons but consider								
simple situation	ns where the								
domain of the f	function must be								
restricted in ord									
inverse to exist,	, such as f(x) =								
x <sup>2</sup> , x>0.									
Make sense of	Reason abstractly	Construct viable	Model with	Use appropriate	Attend to	Look for and make	Look for and		
problems and persevere in	and quantitatively.	arguments and critique the	mathematics.	tools strategically.	precision.	use of structure.	express regularity in repeated		
solving them.		reasoning of					reasoning.		
		others.							

Grade Level/	Course (HS): Alge	bra 1 Unit 5								
Standard with code:		E.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity reasing linearly, quadratically, or (more generally) as a polynomial function.								
Domain:	Linear, Quadrat	ar, Quadratic, and Exponential Models *(Modeling Domain)								
Cluster:	Construct and co	Construct and compare linear, quadratic, and exponential models and solve problems								
Туре:	Knowledge	XReasonin	gPer	formance Skill	Product					
Knowledge T	Targets	Reasoning Tar	gets		Performance Skills Targets		Product Targets			
Fluently compute growth rates for linear, exponential and quadratic functions.		Compare tables and graphs of exponential and other polynomial functions to observe that a quantity increasing exponentially exceeds all others to solve mathematical and real-world problems.  Notes from Appendix A: Compare linear and exponential growth to quadratic growth.								
Make sense of problems and persevere in	Reason abstractly and quantitatively.	Construct viable arguments and critique the	Model with mathematics.	Use appropriate tools strategically.	Attend to precision.	Look for and make use of structure.	Look for and express regularity in			

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others.

solving them.

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repeated

reasoning.